State of California
THE RESOURCES AGENCY
Department of Water Resources

BULLETIN No. 136

NORTH COASTAL AREA INVESTIGATION

A Summary of the Public Hearing Comments and Changes to the Preliminary Edition Dated September 1964

Final Supplement

DECEMBER 1966

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FOREWORD

This supplement serves as the final edition of Bulletin No. 136, "North Coastal Area Investigation". It presents (1) a summary of the public hearing comments received on both Bulletin No. 136 and Appendix A, "Watershed Management in the Eel River Basin"; (2) statements on the action taken by the Department concerning those comments; and (3) the resulting changes to the preliminary edition of Bulletin No. 136. The final edition of Appendix A was published in September 1966.

Public hearing comments on the bulletins were primarily concerned with the need for flood control and project timing and did not significantly challenge the North Coastal water resources planning framework presented in Bulletin No. 136. Changes to the bulletin itself were therefore minor and are most effectively presented in a supplement such as this.

Bulletin No. 136 provides a general description and summary of a seven-year reconnaissance investigation of the North Coast's water resources. It outlines the objectives, activities, and conclusions of the investigation and describes the plans which have been formulated. Appendix A is the report of a special study undertaken in response to Senate Concurrent Resolution No. 47 of the 1961 State Legislature. The report summarizes all aspects of watershed management in the Eel River Basin.

Public hearings were held throughout the North Coastal area on these bulletins during February and March 1965. Transcripts of these hearings are on file with the California Water Commission in Sacramento and the Northern District of the Department of Water Resources in Red Bluff and are available for review by the public.

William E. Warne, Director
Department of Water Resources
The Resources Agency
State of California
December 20, 1966

State of California
The Resources Agency
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ABSTRACT

Five public hearings were held jointly on the North Coastal Area Investigation by the California Water Commission and the Department of Water Resourc in February and March 1965. The investigation, reported on in Bulletin No. 136, was a reconnaissance study of t North Coastal area. Its objective was to formulate plans by which the water resources of the region can be integrated with the State's expanding economy through orderly, staged development.

The hearings, which took place shortly after the devastating floods of December 1964, were used primarily by local people as a North Coastal flood control forum. North Coastal residents want projects that include substantial flood control storage; they also want the state and federal agencies to review their flood frequency studies and economic justification criteria and bring them up to date.

This final supplement serves as the final edition of Bulletin No. 136. It summarizes the testimony received at the public hearings and discusses the action taken by the major water development agencies in response to the 1964 floods and the comments made at the hearings. This supplement also presents the changes that should be made in the preliminary edition of Bulletin No. 136 and lists the hearing witnesses.

INTRODUCTION

In accordance with the California Water Code and Department of Water Resources policy, the California Water Commission and the Department of Water Resources jointly held a series of public hearings on the preliminary editions of Bulletin No. 136 and Appendix A. Hearings were held in Willits (February 3, 1965), Willows (February 4, 1965), Weaverville (February 9 and March 15, 1965), and Eureka (February 10, 1965).

Albert J. Dolcini, Acting Chief of the Northern Branch, was the hearing officer for the joint hearings, which were held in accordance with the Water Resources Act of 1945 set forth in the California Water Code under Sections 12616 to 12622 inclusive and Section 12626. William Carah, Executive Secretary, and Orville Abbott, Engineer, represented the California Water Commission at Willows and Eureka.

This final supplement, which takes the place of the final edition of Bulletin No. 136, is divided into four main sections: Summary of Investigation, Summary of Public Hearing Testimony and Action Taken, Changes to Preliminary Edition, and Witnesses.

SUMMARY OF INVESTIGATION

This summary is a reprint of Chapter I, "Summary of Investigation", of the preliminary edition of Bulletin No. 136. At each of the hearings, Eugene F. Serr, Program Manager of the North Coastal Area Investigation, drew from Chapter I to summarize the bulletin and inform those present of the main findings of the investigation.

> There is growing recognition that the key to sustaining California's dynamic growth will be timely and substantial development of new water supplies in the North Coastal area. At the present time, the potential wealth of this resource has scarcely been tapped. Increasing statewide water demands, however, are bringing the threshold of extensive development nearer. The need is manifest for a comprehensive planning framework to ensure that this development is efficient and orderly. This report presents the considerations, conclusions, and plans for development which comprise that framework.

Need For Investigation

With the publication of the preliminary edition of this report in September 1964, the Department of Water Resources concluded the seven-year reconnaissance phase of the continuing North Coastal Area Investigation. The need for this investigation arose from the conclusions of Bulletin No. 3, "The California Water Plan". That document, which culminated ten years of study by the Division of Water Resources, the predecessor of the Department, concluded that there is, in fact, enough water in California to satisfy the State's long-range water requirements if the available resources are wisely controlled, conserved, and distributed. While demonstrating that the State does have sufficient water available, Bulletin No. 3 also outlined the task which would be required to effectively utilize the resource.

With the recognition that much of the future water requirements in the State would be met from surplus North Coastal supplies, it was apparent that a planning framework was needed to assure that each new project in this area represented a logical and orderly increment in long-range development. The basic need was to translate the broad planning concepts reported in Bulletin No. 3 into a workable plan of staged project development. In providing a plan for the North Coastal area, the Department can assure the people of the State that each proposed new project in the area, irrespective of the constructing agency, is a logical and economical step in meeting California's statewide water demands.

An additional need for this investigation stems from the Department's role as the constructor and operator of a statewide water utility. The Department is presently constructing the initial facilities of the State Water Project, a system of works which, when fully operative, will conserve, transport, and deliver to public agencies throughout the State approximately 4,230,000 acre-feet annually of new water supplies. Most of this water will be diverted from the Sacramento--San Joaquin Delta. In recognition that the supplies of water in the Delta will be gradually diminished as development takes place in the tributary areas, provisions were made in the Burns-Porter Act for financing construction of additional conservation facilities needed to maintain the minimum water yield of the State Water Project. With the need to construct the initial additional facility appearing on the horizon, it has been imperative that the State work diligently towards selecting a North Coastal project to satisfy the requirement. The selection of the initial project is reported herein.

Program Objectives

The objective of the North Coastal Area Investigation is to formulate plans for the optimum development of the water resources of the region, considering all potential purposes, including anticipated local and export water supply needs; enhancement of fish and wildlife resources; development of hydroelectric power; development of water-associated recreation potential; and protection against floods. The specific objectives of the reconnaissance phase of the investigation were:

1. To formulate a comprehensive planning framework through which the water resource potential of the North Coastal area can be integrated with California's expanding economy through orderly, staged development.

2. To identify and outline the essential features of the initial additional conservation facility of the State Water Project in the North Coastal area.

3. To determine for the succeeding incremental sources of major water supply in the North Coastal area possible plans for development, the logical sequence of development, the order of magnitude of associated capital investment, and the scale of project accomplishments.

4. To evaluate the potential for integration of hydroelectric power, flood control, recreation, and fisheries and wildlife enhancement with the works of the major water conservation facilities.

5. To identify problem areas that will require specific study when the water development plans are investigated at a higher level of intensity.

6. To provide recommendations relative to programs and actions which will be necessary to effect efficient, orderly, and optimum development of the region's water resources.

Scope of Investigation

The major purpose of an area-wide plan of water development in the North Coastal area is to develop presently uncontrolled runoff for meeting requirements in local areas and for export of surplus water to water-deficient areas within the State. Within the framework of a comprehensive water development plan it is possible to consider many associated and interrelated aspects of water control, distribution, and use. In this investigation the following additonal purposes were considered for inclusions as multiple-purpose uses of the conservation and conveyance facilities: fisheries enhancement, flood control, recreation, and hydroelectric power.

The areal scope of the investigation included consideration of all streams in the North Coastal area which offer apparent potential for economic development of major water conservation projects. The plan of development as presently conceived would include major projects in the Eel, Trinity, Mad, Van Duzen, Klamath, and Russian River Basins. Minor coastal drainage basins, extending north from the Gualala River to Redwood Creek, were given cursory examination as possible locations for fisheries enhancement projects.

In addition to the above streams, which all drain westward to the coast, portions of the contiguous drainage basins on the west side of the Sacramento Valley, through which the exported water would be

conveyed enroute to the Sacramento--San Joaquin Delta, have also been studied. These basins include Putah, Cache, Stony, Thomes, Elder, Cottonwood, and Clear Creeks. The study of these drainage basins was directed primarily to aspects associated with the interbasin transfer of water, such as, possible reregulatory storage sites and hydroelectric power features; however, substantial additional benefits, including conservation of tributary runoff, would be derived from works constructed in these basins.

The North Coastal Area Investigation has embraced many fields of study, including hydrology, geology, surveying and mapping, cost estimates and design, land and water use, watershed management, economics, recreation, fish and wildlife, and hydroelectric power. The intensity or degree of refinement for individual studies ranged from cursory analysis through high-order reconnaissance studies. Summaries of the studies related to each of these fields are in Chapter V. The data and results for each study activity are reported in the appendixes to this bulletin and in the associated office reports.

Conclusions

The conclusions of this investigation are presented in two classes: (1) general conclusions which apply to the overall plan of development for the North Coastal area, and which have a common bearing on all of the proposed plans; (2) specific conclusions regarding planning for the individual major projects which comprise the plan of development.

General Conclusions

1. Approximately 12 million acre-feet of new annual water supply, sufficient to meet California's projected future water needs to beyond the year 2020, could be developed through construction of works similar to those described herein. Of this, 10 million acre-feet would be developed by projects on major streams within the North Coastal area and 2 million acre-feet would be derived from associated works in the Sacramento River Basin.

2. The conservation works associated with development of the major North Coastal streams can be constructed in a series of projects, staged to meet water needs as they arise.

3. Additional increments of water supply to meet demands beyond those presently foreseen could be developed on the numerous minor North Coastal streams; however, the unit cost of developing these supplies would be significantly greater than the range of costs associated with projects on the major North Coastal streams.

4. The timing and sizing of major projects in the North Coastal area will be influenced largely by the rate of demand build-up for new water supplies in other areas of the State.

5. Water requirements within the North Coastal area for irrigation, municipal, industrial, and nonurban domestic uses will grow from a present applied water requirement of 700,000 acre-feet annually to approximately 2,000,000 acre-feet annually by the year 2020.

6. The demands for major increments of new water supply within North Coastal service areas can be met most efficiently and economically through association with large export projects.

7. The major reservoirs constructed for water conservation on North Coastal streams will provide incidental flood control benefits through normal operation. The reservation of reservoir capacity specifically for flood control will in many instances be economically precluded by the high cost of reservoir storage in relation to the value of potential flood control benefits and by the location of the reservoirs high in the watersheds. The conveyance works constructed in adjacent basins tributary to the Sacramento River would offer the potential for substantial reduction of flood damage to local areas along the conveyance routes.

8. The plans for development reported herein include a number of hydroelectric plants; the selection and sizing of these plants were based on power criteria appropriate during the reconnaissance investigation. Projections of future conditions in the electric-power industry indicate a gradual decline in the potential benefits of hydroelectric power, as technological advances reduce the cost of steam electric generation and transmission costs. It is probable therefore that some of the proposed plants will not be economically justified under future analysis.

9. Some of the water diversion plans for the North Coastal area are dependent on large pumping facilities. The projected future lower cost of power production will be reflected in lower costs of power for pumping, thus partially compensating for the potential loss in hydroelectric power benefits.

10. Recreation will be an important joint-use purpose of the water development projects proposed herein. The relative impact on the economy of the North Coastal area, from recreation use at the conservation reservoirs in that area, will be very significant. However, the greatest intensity of recreation use will be at the reservoirs associated with the conveyance and reregulation of the imported water since they will be located closer to population centers.

11. The construction of major reservoirs on the North Coastal streams would significantly affect fish and wildlife resources. For the earlier staged projects, salmon and steelhead could be preserved and possibly enhanced, with conventional techniques, such as hatcheries, artificial spawning channels, and controlled water releases. Wildlife could be maintained by increasing the productive capacity of adjacent lands.

Fishery detriments caused by later-staged reservoirs in the lower reaches of the major streams would create much more difficult preservation problems. For these projects, the conventional preservation techniques would have to be supplemented by new and presently untried measures. One possibility would be the relocation of fish runs to the minor coastal streams. It is doubtful, however, whether the entire anadromous fish population of the Klamath River could be preserved if a major dam is constructed on the lower reaches of that stream.

12. The plans described herein embrace areas of water resource development in which local, state, and federal agencies have traditional roles. Only through interagency cooperation in planning and construction will it be possible to efficiently utilize investment capital and technical manpower and ensure that optimum development takes place.

Project Conclusions

The plans for water development described in this report would consist of a number of individual projects. The initial project would fulfill the need for an additional conservation facility of the State Water Project in the North Coastal area. Succeeding projects would meet future statewide water needs arising under the State Water Resources Development System. Possible features of these projects are shown on Plate 1 and are discussed in Chapter IV. The essential conclusions regarding the definition of each project are as follows:

Upper Eel River Development

1. A multiple-purpose water conservation project drawing surplus water from the Upper Eel River is the most favorable initial North Coastal development for providing augmentative water supplies to the State Water Project at the Sacramento--San Joaquin Delta.

2. The physical works of this project would include conservation reservoirs on the Middle Fork of the Eel River in Mendocino County, and associated works to convey the surplus water to the Delta, via either (1) pumped diversion to a reservoir on the upper main Eel River with subsequent gravity diversion via Clear Lake, Soda Creek, Putah Creek, and Lake Berryessa, or (2) gravity diversion to elements of the Glenn Reservoir Complex on Thomes and Stony Creeks on the west side of the Sacramento Valley.

3. The primary purpose of the Upper Eel River Development would be to conserve water supplies for delivery to water deficient areas within the State under the utility operation of the State Water Project. Additional purposes would include flood control, fisheries enhancement, power generation, and recreation.

4. The wide range of physical alternatives within the development preclude selection of an optimum project scale or final identification of specific project features on the basis of reconnaissance studies. These phases of project formulation will be accomplished in the feasibility-level studies which began July 1, 1964.

5. The operational flexibility and comprehensive range of project services associated with this development offer a unique opportunity for joint participation between the state and federal agencies in planning, construction, and operation of the project. Such cooperative effort would be mutually advantageous to all of the agencies.

Paskenta-Newville Project

1. The Paskenta-Newville Project on the west side of the Sacramento Valley, utilizing the two northernmost elements of the Glenn Reservoir Complex, would be one of the more favorable remaining water conservation developments in the Sacramento River Basin.

2. The Paskenta-Newville Project would conserve the surplus flows of Thomes and North Fork Stony Creeks. It would be possible later to integrate the storage facilities of this project with the whole Glenn Reservoir Complex for reregulation of water imported from the North Coastal area.

3. The major portion of water conserved by this project would be released to the Sacramento--San Joaquin Delta for firming unregulated flows. Additional purposes would include local water service, recreation, and fisheries enhancement.

4. The storage facility would consist of two reservoirs with a connecting spillway channel: Paskenta Dam and Reservoir on Thomes Creek and Newville Dam and Reservoir on North Fork Stony Creek. Total gross reservoir storage would be 1,200,000 acre-feet. The estimated capital cost of the project is $30 million.

5. If operated on a schedule for firming unregulated flows in the Delta, the project could develop a new annual yield of 200,000 acre-feet.

6. The scale of this project is limited by the amount of runoff tributary to the site. The potential storage in Newville Reservoir is much greater than is needed to control the runoff. The 1,200,000 acre-feet capacity is based on statistical considerations related to the time required to fill the reservoir.

Trinity River Development

1. When statewide water demands require development of major North Coastal water supplies beyond the capability of the Upper Eel River Development, the next most favorable sources of surplus water will be in the Upper Trinity River and adjacent basins.

2. The water resources in the Upper Trinity River and its adjacent basins could be developed through the staged construction of three physically integrated projects. These projects have been designated the Trinity Diversion Project, the South Fork Trinity Project, and the Mad-Van Duzen Project.

3. The three Trinity River projects are comprised of two groups of physical works: (1) conservation features on the North Coastal streams, and (2) associated conveyance features to and reregulatory features within the Sacramento River Basin.

4. The relationship between physical and economic factors associated with the conservation features of the three projects results in a very narrow latitude in selecting the optimum scale of development. The export yield from each project would be approximately 600,000 acre-feet per year, for a total three-stage annual yield of 1,800,000 acre-feet.

5. There are two alternative routes for exporting water from the Trinity River Basin to the Sacramento River Basin: (1) gravity diversion to Clear Creek, or (2) gravity diversion to Cottonwood Creek. Selection of the route will be made when demands for water service require feasibility-level studies of the projects.

6. The routing via Clear Creek permits generation of substantial quantities of hydroelectric power through construction of reservoirs and powerplants on Clear Creek. However, under projected planning criteria such power generation would be economically marginal. Very little additional new water yield is developed on Clear Creek itself; hence, the scale of accomplishments of a project with routing via Clear Creek would be controlled by the scale of the North Coastal area conservation features.

7. Trinity River yield routed via Cottonwood Creek could be conveyed through the Westside Conveyance System to the Glenn Reservoir Complex. The scale of accomplishments of a Trinity River project with this routing would be considerably greater than with the Clear Creek routing since additional new water yield would be derived from the Westside Conveyance System and the Glenn Reservoir Complex.

Greater Berryessa Project

1. An exceptionally large reservoir with a low unit cost of storage could be formed by construction of a high dam downstream of the existing Monticello Dam.

2. An enlarged Lake Berryessa could economically provide the following services: water conservation, through pumped diversion and storage of Sacramento River flood flow; hydroelectric power utilizing reversible pump-turbine units; reregulation of water conveyed from the Eel River.

3. An enlarged Lake Berryessa, with a storage capacity of 14,000,000 acre-feet, would produce a new annual yield in the Sacramento--San Joaquin Delta of about 1,600,000 acre-feet from drawdown storage and firming of unregulated flows. This would be in addition to releases for the Solano Project and to whatever yield is imported from the Eel River Basin.

4. Staging considerations indicate that this project should be deferred until demand for project services of this large scale develops.

Lower Eel River Development

1. Major water conservation projects on the Eel River below Dos Rios should not be constructed until after the more favorable developments in the Upper Eel River and Trinity River Basins.

2. The primary reason for this later staging is the very high cost of relocating the Northwestern Pacific Railroad out of the Eel River canyon. A major reservoir on the Lower Eel River would necessitate relocation of about 100 miles of this roadway, at an estimated cost of $130 million.

3. With the works shown in this report, approximately 1,000,000 acre-feet of new annual yield could be developed for export from the Lower Eel River.

4. The Lower Eel River Development is not susceptible to staged construction. The railroad relocation must be accomplished at one time and the high associated cost could not be absorbed with anything less than full-scale development.

5. The water diverted from the Lower Eel River will be pumped upstream through the conservation reservoirs of the earlier-staged Upper Eel River Development. The tunnels and pumping plants of the Upper Eel River Development, however, should not be sized to accommodate Lower Eel River yield, since the incremental capitalized cost of providing the excess capacity during the interim period would exceed the cost of constructing additional facilities at the time of need.

Klamath River Development

1. The water resources of the Klamath River Basin, including the Lower Trinity River, represent the largest potential source of surplus water in the North Coastal area. Projections of state-wide demand indicates that development of this water will not be required for many years.

2. The scale of any project conserving water on the Klamath River and diverting it to the Sacramento Valley would be very great. The scale is indicated by one of the possible plans, which would include construction of Humboldt Dam and Reservoir. This reservoir, with gross capacity of 15,000,000 acre-feet, would develop approximately 6,000,000 acre-feet of firm annual yield. With the associated conveyance system to the valley, the works of the project would represent an investment of over $1.6 billion.

3. Any large dam constructed on the lower reaches of the Klamath River would serve as an impassable barrier to anadromous fish.

The existing runs of salmon and steelhead are so large that conventional methods of preservation would be able to preserve only a small portion of the resource. The potential fisheries loss could possibly be mitigated by the associated improvement of conditions for fish production on the smaller coastal streams.

Knights Valley Project

1. The future construction of Knights Valley Reservoir on Maacama and Franz Creeks, tributaries of the Russian River, would provide a favorable multiple-purpose project. This comprehensive water development would provide water services within the Russian River and adjacent basins.

2. The Knights Valley Project offers potential for staged development, parallel to the growth of demand for water services. An initial stage would be justified on the basis of developing flows in Maacama and Franz Creek. Later staged development would include raising the two dams and construction of diversion facilities for pumping surplus flows from the Russian River into the enlarged reservoir. Under full development, a reservoir with gross storage of 1.5 million acre-feet could provide a new water yield of 300,000 acre-feet per year.

3. Services provided by this project would include water conservation for agricultural, municipal, and industrial uses, flood control in the Russian River Basin, and outstanding recreation.

4. The plans which have been proposed for this project by the federal agencies are in broad agreement with the objectives of The California Water Plan. The State supports the long-range intention of the federal agencies to construct the project.

Recommendations

The substance of the recommendations from this investigation was presented in the Department's Preview Report to this bulletin, published in September 1963. In order to ensure continuity in the transition to the subsequent planning programs, the Department has already taken actions to implement the recommendations. These recommendations and the actions taken toward their implementation are as follows:

1. Recommendation: That Upper Eel River Development be officially selected and identified as the initial additional conservation facility of the State Water Project in the North Coastal area.

   Implementation: The Upper Eel River Development was authorized on March 9, 1964. Pertinent aspects of the authorization are discussed in the next section in this chapter.

2. Recommendation: That a planning program conducted to feasibility standards be initiated for the Upper Eel River Development in July 1964. The program should include specific study in the following categories: water operations, flood control, hydroelectric power, recreation, fisheries and wildlife, water quality, watershed management, hydology, geology, and economics.

   Implementation: A feasibility-level planning program for the Upper Eel River Development was initiated in July 1964. The program is discussed in Chapter VII.

3. Recommendation: That formal agreements be negotiated with the concerned federal agencies to provide a cooperative planning program for the Upper Eel River Development.

   Implementation: Preliminary steps towards cooperative planning for the Upper Eel River Development have been initiated through the California State-Federal Interagency Group. Various aspects of federal-state cooperation are discussed in Chapter VI.

4. Recommendation: That the plans described herein be considered a planning framework for the development of the major sources of surplus water in the North Coastal area; and that the local, state, and federal agencies responsible for aspects of economic development which would affect or be affected by the plans, including other natural resources, transportation, and industry, consider future development in the light of these plans.

   Implementation: This report (Bulletin No. 136) is the vehicle through which the recommended consideration will take place.

5. Recommendation: That the plans presented herein for major water projects to follow the Upper Eel River Development be refined and modified on a continuing basis to reflect statewide water demands and technological changes, and that adequate funds be provided to support this planning program.

   Implementation: Funds were provided in the 1964-65 and subsequent budgets for the continuing area-wide North Coastal Area Investigation. This program is discussed in Chapter VII.

Authorization of the Upper Eel River Development

The Director of Water Resources is vested by law with executive authority to add certain units to the State Water Resources Development System. With specific reference to Sections 11290, 12931, and 12938 of the Water Code, the Director signed Project Order No. 7 on March 9, 1964, which authorized the Upper Eel River Development as an additional facility of the State Water Project. By virtue of this action, the project has been officially selected and legally identified as the State's initial additional water conservation faciltiy in the North Coastal area.

Previous reports of the Department indicated that a project drawing surplus water from the Middle Fork Eel River would be selected as the initial state facility in the area. These reports included the Progress Report for the North Coastal Area Investigation, published in May 1961, and the Preview Report to this bulletin, published in September 1963.

The primary purpose of the development will be to augment water supplies available for diversion from the Sacramento--San Joaquin Delta, so as to prevent a reduction in the minimum water yield of the State Water Project. The major portion of new water developed by the project will thus be used to guarantee delivery of presently contracted water service. Additional purposes associated with the development will include water service to local areas, flood control, hydroelectric power, recreation, and fisheries and wildlife enhancement.

The works of the Upper Eel River Development are discussed in Chapter IV.

SUMMARY OF PUBLIC HEARING TESTIMONY AND ACTION TAKEN

The vast majority of comments received at the hearings stressed the need for flood control projects, both in the North Coast and in the upper Sacramento Valley. The message was clear. The people in the North Coast want projects that include substantial flood control storage, and they want them as quickly as possible.

The major points made in the testimony received at the hearings are briefly summarized below. A brief statement of the action taken in response to these comments follows each of the points.

1. It was urged that future water development plans give much greater emphasis to flood control and power generation. State and federal agencies should review their flood frequency studies and economic justification criteria and bring them up to date. Strong efforts should also be made to increase federal appropriations for flood control.

Action Taken: Since the 1964 flood, the Department has advocated a broader approach to flood control and proposed the preparation of master flood control plans for the State's basins to give proper consideration to possible abatement of flood damage. State and federal agencies have reviewed and are updating their flood studies. These agencies, as members of the California State-Federal Interagency Group, are presently formulating a master plan for water development in the Eel River Basin. The interagency group will evaluate the possible early construction of various projects in the basin for flood control. The Department's advance planning program for the Upper Eel River Development gives greater emphasis to flood control and power generation than did the reconnaissance phase. The North Coastal Area Investigation reconnaissance study likewise gives greater emphasis to flood control. DWR Bulletin No. 159-65, "California Flood Control Program", published as a result of the 1964 flood, provides a guide for all agencies in providing much-needed flood control.

2. Strong support was given for early construction of proposed multiple-purpose water development facilities on the Eel and other important North Coastal rivers for flood control.

Action Taken: The Department prepared a reply to the Legislature in response to Senate Concurrent Resolution 14 asking that the Upper Eel River Developments be constructed early for flood control purposes, prior to the time they are needed for water conservation. The reply,

presented to the Legislature in January 1967, supports this request. The sequence of construction of North Coastal Area projects as outlined in the preliminary edition of this bulletin could be altered by the local demand for flood control as well as changes in the outlook for construction of water projects to meet water needs in California and in the Pacific Southwest.

3. Early construction of the Paskenta-Newville Reservoir was strongly supported because of serious flood damage in the area.

Action Taken: The Department also prepared reports to the Legislature in response to legislative resolutions (SCR 9, ACR 28, and SR 88) requesting that the State work out an interagency agreement for the construction of the Paskenta-Newville project. On September 1, 1966, an interagency agreement was reached whereby the U. S. Bureau of Reclamation will complete feasibility-level planning on, and seek federal authorization for, the Paskenta-Newville project. The Department fully supports this agreement.

4. Property owners in the Eel River Delta support flood control dams in the upper Eel River Basin. They feel that levees in the delta would not control the peak flow and would, in addition, lull residents into a false sense of security.

Action Taken: The Department's position on this is that a full plan of flood protection for the Eel River Basin should include levees in the Eel River Delta, flood control reservoirs on the main streams, watershed management, and a workable plan of flood plain management.

5. Numerous comments were made that adverse effects resulting from land use in the various watersheds definitely played a role in the 1964 floods and that research is needed to ascertain the magnitude of this effect.

Action Taken: The Soil Conservation Service of the U. S. Department of Agriculture is performing Eel River watershed management studies under an interagency plan to formulate a single plan of water resources development for the Eel River Basin. Their studies are scheduled for completion in the Eel River Basin early in 1967, and extension to Mad, Trinity, Klamath, and Smith River Basins in coming years.

6. The feasibility of small dams in the upper portions of the watersheds should be investigated carefully.

Action Taken: The Soil Conservation Service is also looking into the possibility of small dams in the upper watersheds, particularly with regard to the sediment reduction that could be accomplished. The Department is also considering this possibility in its continuing North Coastal studies.

7. The Trinity County supervisors protested that reservoirs flood out much valuable land, thus reducing the tax base. They would like to receive some sort of payment for water exported from their area.

Action Taken: This is a problem inherent in almost all reservoir development. The U. S. Bureau of Reclamation is presently conducting feasibility-level studies of several projects in the lower Trinity River division and is giving consideration to this problem. Perhaps the agency that develops a project could pay money to the county in lieu of the taxes that are lost when land is taken for a project. This "in lieu" money could be paid to the county until the value of the land around the reservoir rises to equal the value of all the land before the project was built. This approach is not yet the policy of any major water agency.

8. Both proposed routes (via either Clear Lake or the Glenn Reservoir) for transfer of Eel River water to the Sacramento-San Joaquin Delta were strongly supported.

Action Taken: Intensive engineering evaluations, geologic explorations, and other special studies are currently underway as part of the advance planning on the Upper Eel River Development's route selection. Selection will be made in June 1967; results will be published in Bulletin No. 171-1 as soon as possible thereafter.

9. Fisheries interests opposed a number of the dams studied in the North Coastal investigation as detrimental to fish. They hope that a breakthrough in salt water conversion will make the later stages of North Coastal water development unnecessary.

Action Taken: Time and technology will provide solutions to fishery preservation and sea water desalination problems. The California State Department of Fish and Game is well aware of what effects North Coastal projects will have on fish and wildlife. Planning on many of the future North Coastal export projects will be done by federal agencies. It is imperative that the U. S. Fish and Wildlife Service recognize and assume the responsibilities for comprehensive fish and wildlife planning in connection with these projects.

10. The needs of local areas for local irrigation and municipal water use, recreation development, fishing improvement, hydroelectric power development, and watershed management were emphasized in addition to flood control needs. The price of local water should be within the ability of the land to repay.

Action Taken: In July 1965, the second phase of the North Coastal Area Investigation was reoriented into two principal studies -- a South Fork Eel River study and the continuing Trinity-Klamath study. The South Fork Eel River study is aimed at identifying feasible local projects on tributaries, primarily for recreation and fishery enhancement and any flood control possible. A bulletin on this study will be published in 1967.

The Department established the Eureka flood warning office in November 1965. This office will also serve as headquarters for a North Coastal planning engineer and a local assistance engineer. These men will become thoroughly familiar with local needs. The state's Davis-Grunsky program of financial assistance to local water development agencies will be stressed. A North Coastal Action Program was initiated in July 1966 to focus on the smaller-scale local development possibilities in the North Coastal area for possible acceleration of the lagging economy.

During the North Coastal Area Investigation, which was completed prior to the unprecedented flood of December 1964, the Department concluded that the reservation of storage capacity specifically for flood control in the conservation reservoirs of the early stage major North Coastal projects probably would not be economically justified. Since the December 1964 flood, both the Department and the U. S. Army Corps of Engineers have been reevaluating their flood control analyses, particularly benefits, in an attempt to show justification for more flood control storage.

In view of the December 1964 flood and the comments concerning flood control received at these hearings, it is recommended that the North Coastal planning studies of all major water agencies consider flood control as a major part of all water projects.

CHANGES TO PRELIMINARY EDITION

The following changes should be made to the preliminary edition:

Page xiv: "Engineering Geology", listed under Office Reports, was actually published as Appendix E.

Page 2, sixth line from top: "4 million acre-feet" should read "4,230,000 acre-feet".

Page 5, step 7, line 4: "most cases" should read "many instances".

Page 13, step 2, third line: "with a target completion date of 1968" should be deleted. Same step, under Implementation, first line: "four-year" should be deleted.

Page 14, step 5, under Implementation: First line should read "Funds were provided in the 1964-65 and subsequent budgets".

Page 20, second paragraph, next to last line: "less than half" should read "approximately one-half of".

Page 24, starting with second complete sentence at top of page: should read "there is a harbor at Crescent City to handle light-draft vessels and barge traffic. Noyo Harbor at Fort Bragg is currently an important fishing port. However, a project has been authorized to construct breakwaters that would make it possible for deep-draft commercial shipping to operate from this harbor".

Page 38, top of page: sentence beginning "Chapter V contains ----" should be deleted.

Page 46, first paragraph, beginning "the reservation ----": "Prior to the unprecedented flood of December 1964, it was concluded that" should be added to the beginning of the sentence.

This paragraph should follow the first paragraph: "Since the flood of December 1964, both the Department and the U. S. Corps of Engineers have been reevaluating their flood control analyses, particularly benefits, in an attempt to show justification for more flood control storage."

Page 48, next to last paragraph third line: "practical" should read "impractical".

Page 50: last sentence in first paragraph should read "the projected timing and magnitude of future water requirements are discussed in Department Bulletin No. 160-66, 'Implementation

of the California Water Plan' (March 1966). This report was prepared by the Statewide Planning Office of the Department."

Third paragraph:

Bulletin reference should read "Bulletin No. 132-66, 'The California State Water Project in 1966'."

Page 51, first line: "4,000,000 acre-feet" should be changed to "4,230,000 acre-feet".

Page 58: the paragraph on the Greater Berryessa Project should be the first item under the Subsequent and Later-Staged Projects.

Page 60, second paragraph, last sentence: should read "the decision will be made during the feasibility-level planning for the Upper Eel River Development and discussed in detail in Bulletin No. 171-1, 'Upper Eel River Development -- Interim Report', scheduled for publication in the summer of 1967".

Page 62, third paragraph, next to last line: 180 should be 200 and 370 should be 390.

Page 65: "(1964)" should appear under the heading "Capital Cost".

Page 72, fourth paragraph, third line: "dizes" should read "sizes".

Page 96: the following paragraph should be inserted between the first and second paragraphs of the "Plan of Development" section. "It should be noted that the size of Sequoia Reservoir, as described above, would be the optimum for a single-purpose water conservation project, but it would not necessarily be the recommended size if a multiple-purpose project is needed."

Page 107, first paragraph under Hydrology Studies, last line: "Bulletin No. 142-1.1" should read "Bulletin No. 142-1".

Page 111, second paragraph, third line: reference should read "Bulletin No. 142-1".

Page 139: an article entitled Watershed Management should appear before the Economics, Land and Water Use article. See page 19 for the complete text of this article.

Page 144: the "Coordinated Statewide Planning Program" description should be revised. See page 22 for the revised text.

Page 155, third paragraph, sixth line: should read "diversion via Clear Lake and Cache Creek, or via Putah Creek, and Lake Berryessa to the".

Page 156, last paragraph, last line: should read "enhancement; and (5) develop a master plan for the Eel River Basin which would consider all water-related problems".

Page 157, fifth paragraph: "May 1960" should read "July 1964".

Page 158, third paragraph: "June 1962" should read "February 1965".

Fifth paragraph: "Date" column should be revised as follows.

Date	
August	1964
January	1965
July	1965
May	1965
April	1965
August	1965
July	1965
March	1964
November	1964
June	1965

Last paragraph: reference should read "Bulletin No. 142-1, Volume I".

Page 159, first paragraph, first line: "July 1961" should read "July 1964".

Plate 1 has been revised as follows: Iron Canyon was deleted as a possible additional facility. Wilson Valley damsite was added on Cache Creek.

Greater Lake Berryessa was changed from an earlier staged facility (red) to a later staged facility (green).

Watershed Management article to be inserted in page 139:

Watershed Management

The term "watershed management" has many definitions, depending almost entirely upon the "authority" defining the term. However, all agree that soil, water, and vegetation, as they relate to people's needs and desires, are central to the watershed management concept.

The following definition of watershed management was used by the Department of Water Resources for this report. "The art and science of managing the land, vegetation, and water resources of a drainage basin for the control of the quality, quantity, and timing of water, and for the purposes of enhancing and preserving human welfare." The broad objective of watershed management then is to manage the land and water resources for hydrologic ends desirable to human welfare. Watershed management simply concerns itself with the way in which water comes off the land, and the effect this may have on the related resources.

A study of the watershed management needs within the Eel River Basin was made in compliance with the request of Senate Concurrent Resolution No. 47 of the State of California. Because of limited funds and personnel, this study was limited to the Eel River Basin. The study consisted of two principal phases: (1) extensive library research and contact with specialized authorities, and (2) extensive field observations and contact with field workers. Specific watershed management problems were thus identified and studied in as much detail as possible in the time available. The results of the study are contained in Appendix A, "Watershed Management in the Eel River Basin". Following is a summary of the material contained in the appendix.

Present Land Use Practices

The economy of the Eel River Basin has long been dependent upon the development and utilization of its abundant natural resources. Logging, lumbering and manufacture of forest products have been especially important in supporting the local population. In more recent years, the recreation assets of the Eel River area have become prominent and are centered around the world-famous coast redwoods, which attain their maximum size in the basin. Agriculture is also important in the Eel River area, primarily in the raising of beef cattle and sheep.

Most of the uses of land for recreation are nondestructive or in some cases, even preservational. Generally, only a small amount of the total land allocated for recreational purposes is actually used, although this may be used heavily.

The principal agricultural activity in the Eel River drainage is centered around livestock. Dairying is prevalent in the Eel River Delta, while wildland grazing is practiced throughout much of the remaining part of the basin.

Erosion

Although most of the soils in the Eel River Basin have a relatively high resistance to surface erosion, overgrazing and inadequate logging practices have produced a number of areas where sheet and gully erosion have taken place. Such erosion is found most frequently in the central belt of grasslands, woodland-grass, and woodland. Severe examples of erosion can be seen in numerous widespread locations within this broad area. Erosion from improperly placed drainage structures, which concentrate large flows in channels with inadequate capacity, can be found on roadways of every type in the Eel River Basin. Erosion can also occur along permanent and intermittent streams by the cutting action of the water against the banks of the stream. In many instances, this phenomenon is man-aggravated. Occurrences of bank cutting can be observed along almost any permanent stream in the Eel River watershed.

Sediment

A great deal of sediment is transported in the Eel River and its tributaries. In part, this is the natural product of geologic erosion and mass wasting. Typically, the movement of fine, suspended sediment in the Eel River system varies directly with the flow. However, variation in suspended sediment discharge changes with the seasons; more occurs in the late fall and early winter months than in the late winter and spring months. Most of the sediment flow occurs during a small percent of the time. Roadway construction, logging operations, and grazing activities are the principal sources of excessive man-caused sedimentation in the Eel River Basin.

The sediment in the Eel River Basin impairs the fisheries and wildlife resources, lessens the recreational appeal of certain stretches of the river and its tributaries, creates increased flood stages, hinders low flow discharges, and decreases the life of downstream reservoirs.

The streams in the Eel River Basin have a much higher concentration of sediment than the streams on the west side of the Sacramento Valley. This presents a problem in the design and operation of a number of the proposed reservoirs in the Upper Eel River drainage. When the sediment load contains a high percentage of particles in the clay range, as is the case in the Eel River above Lake Pillsbury, the storage of muddy water becomes a problem.

Landslides

Landslides are the Eel River country's most notorious item from a soils management point of view. They have been geologically important in forming the landscape and are at present a somewhat limiting factor in the development of the area. Landslides have created serious maintenance problems on the railroads and highways in the Eel River Basin. Their effect on soil loss and sediment production is not well documented, although they are suspected of being quite instrumental in producing sediment.

Earthflows occur naturally on soils derived from finer-grained sedimentary and metamorphic rocks. Such earthflows are extensive throughout the Eel River Basin and are commonly found along ridge tops and at higher elevations in the central and eastern areas of the Eel River Basin.

In addition to the earthflow-type of landslide, slump or standard rotational landslides are often triggered by the accumulation of earthflow on steeper slopes. Ordinarily this occurs at the lower edge of a slope adjacent to a stream channel. Numerous slides of this type are evident on the main stem of the Eel River from Eel Rock to the vicinity of Hearst, along the lower reaches of the Black Butte River, on the Middle Fork Eel River above the Covelo Ranger Station, and elsewhere.

Contents of Watershed Management Appendix

Appendix A includes descriptions of the more important physical characteristics of the watershed, including technical discussions of subregional climate, geology, soil classifications, types of vegetation, surface water hydrology, surface water quality, and the economy of the Eel River Basin with particular reference to the timber, recreation, and agricultural industries.

A chapter dealing with the current and historical watershed management problems of the Eel River Basin includes discussions of road construction, the occurrence of the coast redwood, and case histories of the Bull Creek and Corbin Creek watersheds.

With the existing land use in the Eel River Basin, the stewardship of its resources becomes important. An examination of the agency system of management and the partial enumeration of the duties and responsibilities of the various concerned state and federal agencies are discussed. This discussion is presented to point out the overlap of present management coverage, to reveal voids in which no responsibility has yet been assigned, and to report upon those areas in which no legal concern has, as yet, been interpreted by any agency.

Finally, the conclusions, as drawn from the limited study, together with some of the more apparent and urgently desirable watershed management needs in the Eel River Basin, are enumerated.

Coordinated Statewide Planning Program article, revised, for page 144:

Coordinated Statewide Planning Program

Data relating to land and water use in the State are being compiled under the Department's Coordinated Planning Program. These data are used to determine each area's future water requirements. This activity has initially been concentrated in the northwestern part of the State, since it is anticipated that large amounts of surplus water will be exported from this area. It is of fundamental importance to have information concerning the amount of water which can be made available for export without depriving the area of water necessary for its own economic development.

Results of these studies, which cover land and water use and land classification with respect to possible future use, are presented in the Bulletin No. 94 series. Bulletins of this series have been completed and published for the following hydrographic units in the North Coastal area: Trinity River, Eel River, Russian River, Mad River--Redwood Creek, Mendocino Coast, Klamath River, Shasta-Scott Valleys, Smith River, and Lost River--Butte Valley.

Bulletin No. 142-1 (April 1965), also prepared under the Coordinated Statewide Planning Program, contains data and discussions

relative to water supply, estimated future water requirements, and surplus water available for export. This bulletin covers the southern portion of the North Coastal area and includes the Trinity River, Eel River, Russian River, Mad River--Redwood Creek, and the Mendocino Coast hydrographic units.

Bulletin No. 160-66, "Implementation of the California Water Plan" (March 1966), presents conclusions concerning the water development projects necessary to meet the future water requirements in the various major hydrographic areas of the State. These conclusions are based on current estimates of future growth as related to the latest land and water use data mentioned above. Additional bulletins of the No. 160 series will be published as estimates of future water requirements are refined and a schedule of future water development projects is formulated.

WITNESSES

Individuals and organizations making statements on the bulletins are listed in the following sections.

Oral Statements

Lt. Col. Robert H. Allan, District Engineer, U. S. Corps of Engineers, San Francisco

Lloyd L. Bernhard, U. S. Forest Service, Assistant Regional Forester, Division of Watershed Management, San Francisco

Marshall A. Blank, U. S. Corps of Engineers, San Francisco

Percy Brown, Bureau of Land Management, Redding

Joseph Carson, U. S. Bureau of Reclamation, Region II, Napa

William Fox, U. S. Soil Conservation Service, Berkeley

Eugene Huggins, U. S. Corps of Engineers, San Francisco

Floyd Tumelson, U. S. Soil Conservation Service, Red Bluff

State Senator Virgil O'Sullivan, Williams

William F. Grader, Executive Officer, North Coastal Regional Water Pollution Control Board, Santa Rosa

Bert Knowles, California Department of Fish and Game, Weaverville

Lewis Reese, California Division of Forestry, Sacramento

C. E. Busby, Consultant, Tehama Flood Control and Water Conservation District

Harold Booth, Glenn County Democratic Central Committee, Orland

Ed Carpenter, Mendocino County Water Engineer, Santa Rosa

Ralph Colbert, Supervisor, Glenn County District No. 3, Elk Creek

Earl Davies, President, Northern California Supervisors Association, Red Bluff

Donald Falk, Eureka Chamber of Commerce, Eureka

Leroy W. Harrison, Supervisor, Trinity County District No. 3, Hayfork

John Jago, Clear Lake Water District, Clearlake Highlands

Lloyd L. Karrer, Supervisor, Trinity County District No. 1, Trinity Center

John D. Larkin, Supervisor, Trinity County District No. 2, Weaverville

George McCabe, Executive Director, First Congressional District Caucus of State Democratic Central Committee, Santa Rosa

Robert McGowan, Co-Chairman, Butte Basin Protection Association

Sam S. Mitchell, Supervisor, Humboldt County, Eureka

J. Dwight O'Dell, Eel River Flood Control and Water Conservation District, Fortuna

William M. Rablin, Supervisor, Trinity County District No. 4, Big Bar

William Reimers, Supervisor, Glenn County, Orland

Arnold S. Rummelsburg, Director, Water Resources Department of the County of Shasta, Redding

O. C. Ward, North Fork Grange, Junction City

Hazel K. Willburn, Supervisor, Trinity County District No. 5, Ruth

Peter Black, Arcata

Leon E. Boyd, Weaverville

H. Wilford Burman, Chico

Grover A. Gates, Hayfork

Paul McKeehan, Salmon Unlimited, Associated Sportsmen of California, and the California Wildlife Federation, Santa Clara

V. M. Moir, Director-Secretary, Eel River Flood Control and Water Conservation Association, Santa Rosa

Willard Hansen, Eel River Association, Lake County, Lakeport

Frederick M. Hay, Lower Lake

Bill Jones, Lakeport

Arthur King, Lake Times, Lakeport

Charles Rutzen

Harold Smith, Junction City

Arnold B. Young, Douglas City

Written Statements

U. S. Forest Service

U. S. Department of Agriculture, Soil Conservation Service

U. S. Department of the Interior, Bureau of Indian Affairs

California State Senator Virgil O'Sullivan

California State Department of Public Works -- Division of Highways

California State Department of Finance, Economic Development Agency

North Coastal Regional Water Pollution Control Board

Northern California County Supervisors Association

Glenn County Board of Supervisors

Humboldt County Board of Supervisors

Mendocino County Board of Supervisors

Shasta County Board of Supervisors

North Fork Grange, No. 763, Junction City

F. M. Crawford Lumber, Inc., Ukiah

First Congressional District Caucus of the State Democratic Central Committee

Glenn County Democratic Central Committee

Eel River Flood Control and Water Conservation Association

Lake County Flood Control and Water Conservation District

Salmon Unlimited, Associated Sportsmen of California, and the California Wildlife Federation

Leroy W. Harrison, Supervisor Third District, Trinity County

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Albert E. Tanner, San Francisco